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Claims

1. A method for measurements of the orthogonally polarised Bragg wavelengths of one or several birefringent fibre Bragg grating (FBG) sensors, using an FBG wavelength interrogation apparatus, being able to measure the reflected or transmitted Bragg wavelengths from an FBG sensor,
characterized in that the apparatus uses means for generating polarised light and uses at least one electrically controllable fibre optic polarisation controller, which is either operated in a scanning mode to cover a wide range of polarisation states in a certain time period, including the two orthogonal polarisation states corresponding to the minimum and maximum Bragg wavelengths, or operated in a tracking mode with electrical feedback from the signal processing unit of the apparatus to change the polarisation state in order to track the minimum and maximum Bragg wavelengths of each FBG sensor.

2. A method according to Claim 1,
characterized in that the polarised light is generated from a polarised laser source

3. A method according to Claim 1,
characterized in that the polarised light is generated from an unpolarised or partly polarised source in combination with a polariser

4. A method according to Claim 2,
characterized in that the FBG wavelength interrogation apparatus is based on a tuneable polarised, narrowband laser

5. A method according to Claim 3,
characterized in that the FBG wavelength interrogation apparatus is based on a broadband source in combination with at least one tuneable narrowband optical filter and at least one polariser.

6. A method according to one of the Claims 1 to 4,
characterized in that the fibre optic polarisation controller is based on multiple liquid crystal cells to rotate the incoming polarisation state to any other state through a combination of electrical drive voltages to the liquid crystal cells.

7. A method according to Claim 3,
characterized in that the FBG wavelength interrogation apparatus is based on a broadband source in combination with an unbalanced interferometer for converting wavelength variations to measurable intensity variations, and at least one optical filter for selecting the individual FBG sensors.

8. A method according to Claim 3,
characterized in that the FBG wavelength interrogation apparatus is based on a broadband source in combination with at least one edge filter for converting the sensor wavelengths to measurable intensities.

9. A method for eliminating signal fading and optimise the signal amplitude from each of two orthogonally polarised, slightly different laser wavelenghts of at least one birefringent, dual-polarisation fibre Bragg grating (FBG) based fibre laser sensor where laser light at the two orthogonally polarised eigenstates from at least one fibre laser sensor and is passed through at least one linear polariser and mixed in at least one detector, generating at least one electrical beat frequency which is a measure of the birefringence induced in the laser sensor by the measurand,
characterized in that an electrically controllable fibre optic polarisation controller, which is either operated in a scanning mode to cover a wide range of polarisation states in a certain time period, or operated in a tracking mode with electrical feedback from the detector signal to change the polarisation state, is used to align the two orthogonal polarisation states relative to at least one linear polariser to either maximise or minimise the electrical beat signal amplitude.

10. A device for carrying out the measurements of two orthogonally polarised Bragg wavelengths of one or several birefringent grating (FBG) sensors as given in claim 1, using a wavelength spectrometer based on a light source (1) covering all wavelengths of interest, including

- at least one wavelength selective element,
- means (3) for directing the liggt from the source to the fibre Bragg grating sensors and
- means (7, 9) for directing the reflected or transmitted light from the fibre Bragg grating sensors to at least one detector, and
- circuits (10) to compare the detected signals from the light source (1) and the fibre Bragg grating sensor (6), to provide information on the orthogonally polarized Bragg wavelengths, **characterised in that** the device comprises at least one electrically controllable fibre optic polarisation controller (2) receiving light from the light source (1), where the polarisation controller is either operated in a scanning mode, or in a tracking mode with electrical feed back from the signal processing unit of the device, to change the polarisation state in order to track the minimum and maximum Bragg wavelengths of each fibre Bragg grating sensor (6).